Baseline Information on Climate Change Adaptation and Mitigation Strategies in Pangasinan, Philippines

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Abstract – Understanding climate change and its impacts is needed to help decide coping, adaptation and mitigation measures, actions, and policies, and or their appropriate combinations. This baseline study was done to conduct knowledge, attitude and best practices survey on climate change adaptation and mitigation among the different community members in Pangasinan in terms of their ability to describe adverse impacts of climate change and identify appropriate adaptation as well as mitigation measures. The results of the survey showed revealed that there is a moderate level of understanding about climate change, climate change adaptation and mitigation, climate variability, weather and climate. Climate change experienced through extreme weather variability such as more frequent and strong typhoons and flood occurrence demands corresponding adaptation and mitigation strategies. The identified best adaptation practice along agriculture is to practice organic and or sustainable farming. The best practices for mitigation include proper waste management, reforestation or re-greening of forest or denuded areas. Alongside with these is the conduct of networking and information and education campaign on climate change and its impacts. These best practices could be recommended for policy implementation and information and education campaign. These data on best practices could be recommended for implementation as climate change and mitigation strategies.

Keywords – baseline study, climate change mitigation, adaptation strategies

INTRODUCTION

The world in which we live today experiences climate change as evidenced by extreme climate variability in different countries. These changes have a variety of effects on different situations. Countries with higher populations imply that more people will be affected by climate change. Changes in population and economy also alter the impact of climate change both on human systems and for natural systems. An example of this is altered land use and or environmental pollution. Then it is important to have an idea of climate change mitigation and adaptation practices.

Climate change affects more than just change in the weather; it refers to seasonal changes over a long period of time. These climate patterns play a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. Many systems are tied to climate; a change in climate can affect many aspects of where and how people, plants and animals live, such as food production, availability and use of water, and health risks.

Climate change' impact in the Philippines is most often associated with extreme weather disturbance such as typhoons and floods, which in turn, affect many sectors of the economy. With 50.3 percent of its total area and 81.3 percent of the population vulnerable to natural disasters, the Philippines is considered a natural disaster hot-spot. About 85.2 percent of its US$86 billion annual GDP is endangered as it is located in areas of risk. Since 2000, approximately 3 million people have been affected by various disasters annually [1]. Among the countries most affected and worst hit by extreme weather events, the Philippines ranked 5th in 2013 [2]. About an average of 20 tropical cyclones enter the Philippine area of responsibility each year, with eight or nine making landfall. In 2013, the country has suffered from even more violent storms like Typhoon Haiyan locally known as Typhoon Yolanda, which was responsible for more than 6,300 lost lives, more

than four million displaced citizens and $2 billion in damages [3].

Climate change will affect economic development and lead to increased poverty and therefore increases the risks and uncertainties in livelihoods of a significant portion of the Philippine population [4].

Pangasinan is located on the west central area of Luzon in the Philippines and boarders to La Union and Benguet to the north, Nueva Ecija to the east and Zambales and Tarlac to the south. To the west of Pangasinan is the South China Sea. The province also encloses the Lingayen Gulf. The land area of Pangasinan is 5,368.82 square kilometers. The province is 170 kilometers north of Manila, 50 kilometers south of Baguio City, 115 kilometers north of Subic International Airport and Seaport [5].

The province experiences two pronounced seasons; dry from November to April and wet during the rest of the year. Maximum rainfall is observed in August. Average monthly temperature is 27.91°C with the highest occurring in May and lowest in the January.

Information about climate impacts is needed to help decide upon both the urgency and desirability of adaptation and mitigation measures, actions, and policies, and their appropriate combinations. Since climate change is a global problem, decisions with respect to both mitigation and adaptation involve actions or choices at all levels of decision-making from the most local and community level (including families and individuals) to the national and even international levels. It is in this respect that this baseline information study on climate change was conducted.

OBJECTIVES OF THE STUDY

The general objective of this baseline information study is to determine the current situation of the rural and urban communities of Pangasinan related to climate change adaptation and mitigation strategies. Specifically, it aimed to determine the level of knowledge of the respondents on climate change; Identify the attitudes of the respondents towards climate change and identify best climate change adaptation and mitigation (CCAM) practices that could be a basis for policy recommendation.

MATERIALS AND METHODS
Study area

The province of Pangasinan is located on the west central area of the island of Luzon along the Lingayen

Gulf in the Philippines. It is 170 kilometers north of Manila and 50 kilometers south of Baguio City. It is considered as the "food basket" of Region I and the largest among the four provinces in the region both in terms of land area and population [6].
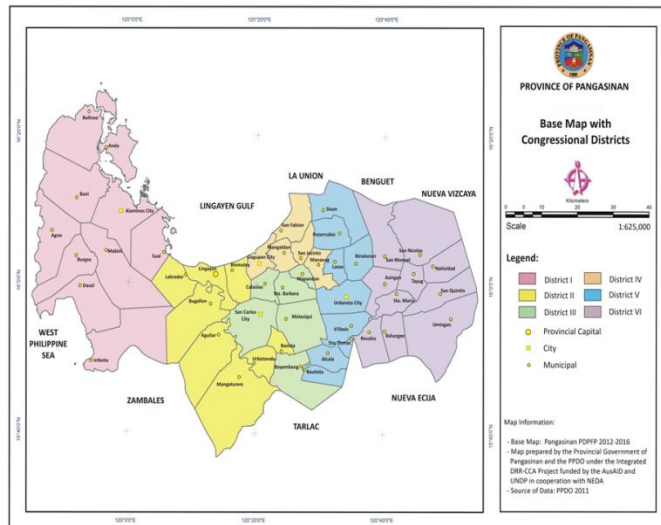

Figure 1. Map showing the municipalities/cities of Pangasinan. Source: Pangasinan Planning Development Office (PPDO), 2011

Data Collection Procedure

The main data gathering tool of this study is a survey questionnaire developed by the researchers which is closed and open-ended. The data gathering instrument is divided into 4 sections which included the following: (1) Socio-demographic profile of the respondent; (2) Level of knowledge of the respondent regarding climate change; (3) Attitudes of the respondents towards climate change and towards project interventions; and (4) Best practices in CCAM.

Respondents

The respondents include representatives from different sectors such as agriculture (Municipal Agriculturists, Pangasinan *Magsasaka Siyentista* Organization Officers (MS), forestry sector from DENR (Provincial/Community Environment & Natural Resources Office (PENRO/CENRO) and CENRO Environment & Natural Resources Office (CENRO) and the respondents representing the fishery sectors are representatives from BFAR and PSU College of Fisheries). Other sector representatives are from Rural Improvement Club (RIC), Head, Heart, Hands, & Health (4H), Indigenous People - IPs) and

from the academe (PSU faculty members/administrators. The purposive sampling method was used and a total of 175 sample respondents were interviewed using the prepared questionnaire. The number of respondents from the different sectors is shown in Table 1.

Table 1. Number of respondents from different sectors.

Sector	Number	Percent
Agriculture	72	41.1
Fishery	28	16.0
Forestry	20	11.4
Others (LGU, PSU, Farmers Organizations)	55	31.5
Total	**175**	**100.0**

The answers of the respondents were encoded and tabulated. Frequency, percentages, average weighted mean and rank were used to present and analyze survey results.

RESULTS AND DISCUSSION
Socio-Demographic Profile of the Respondents
The socio-demographic profile of the 175 respondents is shown in Table 2. There are 96 (54.9%) male and 79 (45.1%) female respondents. As to civil status, majority (80.6%) are married. The age group with the highest percentage is 51-60 (41.1), the youngest group (20-30) is 10.9%, and the oldest group (61-70) is 8.6%. The mean age of the respondents is 47.7 years.

Table 2. Socio-Demographic Profile of the Respondents.

	Profile	f	%
Gender	**Male**	**96**	**54.9**
	Female	79	45.1
	Total	175	100.0
Civil Status	Single	30	17.1
	Married	**141**	**80.6**
	Widow	4	2.3
	Total	175	100.0
Age	20-30	19	10.9
	31-40	25	14.3
	41-50	**26**	**14.9**
	51-60	72	41.1
	61-70	18	10.3
	No response	15	8.6
	Total	175	100.0
	Mean Age	47.7	

Table 3. Relevant Trainings Attended by the Respondents.

Areas of Relevant Trainings Attended *	f	%	Rank
Decision Support System	39	22.29	8
Knowledge Management	71	40.57	5.5
Irrigation Systems	57	32.57	7
Climate Change Adaptation/Mitigation	94	53.71	2
Palay Check System	89	50.86	3
Cooperatives	71	40.57	5.5
Production Technologies	**99**	**56.57**	**1**
Extension Methods	85	48.57	4

multiple response

The relevant trainings attended by the respondents are shown in Table 3. Most of the trainings attended are related to agriculture. Ninety nine (56.67%) has attended training on production technologies, ninety four (53.71%) of the respondents has attended climate change adaptation/mitigation training. However, for (22.29) attended decision support system

Level of Knowledge of the Respondents
on Climate Change
The level of knowledge of the respondents on climate change related terms is presented in Table 4. The respondents either understands or is cognizant/familiar of the terms related to climate change. The terms that respondents understand include those that are related to agriculture such as palay check system, integrated farming system, adaptation and mitigation system in agriculture, managing risks in livestock and climate change impact on animal production. The respondents also understand expressions related to climate such as climate variability, weather and climate information products, weather forecast interpretation and disaster risk reduction. The expressions wherein the respondents have less idea linked to agromet/hydrology and tunder rain which are highly scientific terms.

Table 4. Level of Knowledge of the Respondents on Climate Change

	Climate Change Related Terms	AWM	Level	Rank
a	Palay check system	2.99	3	5
b	Integrated farming system	3.21	3	1
c	Climate variability	3.05	3	4

Table 4. (cont) Level of Knowledge of the Respondents on Climate Change

	Climate Change Related Terms	AWM	Level	Rank
d	Weather and climate information products	2.82	3	9
e	Forecast interpretation, translation and communication	2.77	3	10
f	Climate change adaptation practices	3.15	3	2
g	Weather-related effects on agriculture	3.10	3	3
h	Weather index based crop insurance & other insurance lines	2.68	2	12.5
i	Standard rain gauge	2.48	2	15
j	Agromet data, hydrologic cycle, rain formation	2.48	2	16
k	Disaster risk reduction management	2.87	3	8
l	Managing risks in fisheries due to climate change	2.51	3	14
m	Climate change adaptation and mitigation strategies and technologies in fisheries/water	2.68	2	12.5
n	Managing risks in livestock due to climate change	2.72	3	11
o	Adaptation and mitigation initiatives in agriculture	2.88	3	7
p	Climate change impact on animal production	2.91	3	6

Legend: 1-1.8 = oblivious; 1.81-2.6=cognizant; 2.61-3.4=understands; 3.41-4.2=engaged; 4.21-5=expert

1-Oblivious (has heard about the subject but does not have personal knowledge about it)
2- Cognizant (comprehends the subject)
3- Understands (is in a position to talk about the subject)
4- Engaged (has given the subject some thought and has drawn conclusions about it)
5- Expert (has some degree of authority over the subject)

Perceptions/Attitudes of the Respondents towards Climate Change

The perception/attitude of the respondents towards climate change is shown in Table 5. This refers to the disposition or opinions towards climate change in general and towards project interventions related to climate change. The respondents strongly agree that climate change is much different now than it was 10 years ago. It gets much hotter, floods are frequent, typhoons are stronger and water levels are higher during high tide. These are also based on their own experiences. The respondents agree that it is also their responsibility to ensure that the country must adapt to climate change.

Table 5. Perceptions/Attitudes Towards Climate Change

	Statements Related to Climate Change	AWM	Description
a	The climate change now is much different from what it was ten years ago	4.36	Strongly Agree
b	It gets much hotter these years compared to ten years ago	4.44	Strongly Agree
c	Water levels are now higher during high tide than they were ten years ago	4.22	Strongly Agree
d	Typhoons are now much stronger than they were ten years ago	4.25	Strongly Agree
e	Floods are now more rampant than they were ten years ago	4.32	Strongly Agree
f	Weather is more difficult to predict now than it was 10 years ago	4.10	Agree
g	Weather affects agriculture	3.93	Agree
h	We are now experiencing climate change in our community	4.28	Strongly Agree
i	The Enhanced Climate Field School gives us the appropriate technologies to adapt to climate change	3.85	Agree
j	The Decision Support System of International Rice Research Institute (IRRI) will help us adapt to climate change	3.74	Agree
k	The Philippine Crop Insurance Corporation (PCIC) will help us cope with adverse effects of extreme climate/weather events	3.69	Agree
l	The National Irrigation Administration's (NIA) new irrigation design will be beneficial to us	3.49	Agree
m	Climate change is here to stay	3.75	Agree
n	It is my responsibility to adapt to climate change	4.07	Agree
o	It is the sole responsibility of the government to ensure that the country must adapt to climate change	3.36	Slightly Agree

Best Practices for Climate Change Adaptation and Mitigation

The identified best practices were grouped into three categories which include personal involvement and attitude, agricultural practices and mitigation practices. These were recorded from the open-ended question.

A. Personal Involvement and Attitude

Climate change adaptation practices begin within a person. Everyone is encouraged to do what he preaches, to be always a model in every aspect of life and be a blessing to others. One continues to observe what the best practice is and learns to adapt.

B. Agricultural Practices

In relation to agriculture, the best practices include going back to natural farming based on the adopted practices that have been proven effective thru

research and adaptation in actual techno-demo farms. It also includes the following: practice of organic farming, reduce the use of chemicals, adopt vermicomposting or composting of agricultural waste; use drought or flood resistant varieties; practice integrated pest management; use crop rotation; use proper irrigation management, mulching for high value crops and drip irrigation if possible; use sustainable farming system approach using locally available resources; adapt also organic integrated farming for urban areas; and promote aquaculture primarily to replenish depleted stocks in different bodies of water.

C. Climate Change Mitigation Practices

Climate change mitigation practices are varied among the different respondents. These include the following: Information and Education Campaign (IEC) on climate change to educate residents; proper waste management practices; organic farming; reforestation and vegetation of denuded areas; conservation and rehabilitation of depleted or limited coastal and land base areas; good agricultural practices, use of appropriate technologies for mitigation of greenhouse gas emissions; by networking with other agencies working on CCAM responsible and adoptable practices to adopt changes to environment, food sources and practices; by not burning our materials; protect forest; stop *kaingin* system; continuous information, dissemination, education and sustainable programs for the CCAM; refrain from burning huge quantity of plastics and *styro* to prevent global warming; continuous tree planting; agricultural extension work; re-greening of forest lands and other related agricultural practices, back to basic activities based on the adopted practices experienced and proven effective by many; attend seminars; material recovery program; practice waste segregation; no burning of farm waste instead convert it to animal feeds; and return to basic and implement zero waste.

CONCLUSION AND RECOMMENDATION

The results of this baseline information study revealed that there is an awareness and understanding about climate change and the terms related to it such as climate change adaptation and mitigation, climate variability, weather and climate and others. Pangasinan has experienced climate change in terms of higher temperature, more frequent typhoons and flood occurrences. As such, the respondents in this study agree that it is their responsibility to adapt to climate change. The best climate change adaptation includesgoing back to natural farming and or organic farming. As to climate change mitigation practices, some of these include proper waste management, reforestation or re-greening of denuded areas, networking with other agencies working on CCAM and IEC.

REFERENCES
[1] World Bank. 2008b. Development and Climate Change: A Strategic Framework for the World Bank Group. Washington, DC.
[2] Global Climate Risk Index, 2015.
[3] http://ecowatch.com/2016/01/22/climate-change-affecting-the-philippines/ Retrieved July 15, 2016.
[4] ADB (Asian Development Bank). 2009a. The Economics of Climate Change in Southeast Asia: A Regional Review. Manila.
[5] http://pangasinan.gov.ph/the-province/about-pangasinan/ Retrieved July 15. 2016.
[6] Bureau of Agricultural Statistics. 2013.